AMENDMENTS TO THE SPECIFICATION

Please replace the abstract with the following amended abstract:

A method of forming an electrochemical cell is disclosed. The method comprises contacting a negative pole layer and a positive pole layer one with the other or with an optional layer interposed therebetween. The pole layers and the optional layer therebetween are selected so as to self-form an interfacial separator layer between the pole layers upon such ~~contacting~~ contacting.

Please replace paragraph [0056] with the following amended paragraph:

[0056] According to still further features in the described preferred embodiment the method further comprises the step of printing a sealing ingredient, wherein the sealing ingredient is printed ~~is printed~~ onto the substrate of one of the group consisting of the positive pole layer, negative pole layer and positive pole layer, and negative pole layer.

Please replace paragraph [0083] with the following amended paragraph:

[0083] The present invention is of thin layer, liquid state electrochemical cells that include self-formed separators and ~~arid~~ methods for their production.

Please replace paragraph [0085] with the following amended paragraph:

[0085] Before explaining at least one embodiment of the invention[[,]] in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in various ways: Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description only and should not be regarded as limiting.

Please replace paragraph [0096] with the following amended paragraph:

[0096] According to the present invention, the negative and positive pole layers may be formed by coating a pair of thin inert sheets or films, such as MYLAR® ~~MYLAR.RTM.~~ film, other PET

(polyethylene terephthalate) film or polyester film, with the selected pole ~~poles~~ materials and electrolyte solutions. The two films are brought into contact with each other and an interfacial porous separator self-forms at the interface between the two pole ~~two-pole~~ layers.

Please replace paragraph [0099] with the following amended paragraph:

[0099] Preferably, the electrochemical cell with a self-formed separator is made as follows: First, an ink (current conductor) is applied onto inner sides of first and second substrates. Optionally, current conductor ink can be applied on the inner side of only one substrate. Suitable substrates include any suitable porous or non-porous material. Preferably, the substrate is a porous material. Preferably, substrate is a flexible material, such as, but not limited to paper and polyester. Preferably, a positive pole powder is applied on the ink of the first substrate and a negative pole powder is applied on the ink of the second substrate. Most preferably, the pole powders are applied onto the current conductor inks, after drying the current conductor ink. An electrolyte containing a deliquescent material, an electrosoluble material and a watersoluble polymer is then applied onto the layer of negative pole and onto the layer of positive pole. Preferably, the electrolyte is applied onto the layer of pole after drying the layers of pole powder. In such a way, ~~way~~ a substrate with positive pole layers can be formed and a substrate with negative pole layers can be formed. Preferably, the positive pole layer and the negative pole layer include components (ingredients), which interact to self-form a separator layer between the negative and positive poles. More preferably, the electrolyte solution in the negative and positive pole layers include ingredients, which are selected such that an interfacial porous separator layer self-forms as a result of an interaction therebetween upon contacting. Preferably, the ingredients include one or more water-soluble polymer(s) and, optionally, one or more polymerizing agent(s). The first and second substrates are contacted with each other readily facilitating contact between components in the negative pole layer electrolyte and components in the positive pole layer electrolyte which interact, to self-form a separator and such that the inner sides of the first and second substrates face the self-formed separator, so that a three layer cell is formed. Preferably, at a suitable stage in the process, a sealing ingredient can be applied onto at least one of the pole substrates or onto both of the pole substrates. Preferably, the sealing ingredient is applied onto the perimeter of the substrate/s. Any suitable sealing ingredient can be used, such as but not

limited to a glue, pressure sensitive glue, a heat sensitive glue, an adhesive, a melting material, an ultrasonic welding material, hot melt polymer or combination thereof. The sealing ingredient facilitates adhering and sealing together of the two pole substrates. In some embodiments, after the first and second substrate layers are joined together, high pressure can be applied to the regions with the sealant.

Please replace paragraph [0101] with the following amended paragraph:

[0101] Most preferably, the electrochemical cell with a self-formed separator is made by a printing technique according to the following method. First, an ink (current conductor) is printed onto inner sides of first and second substrates. Optionally, current conductor ink can be printed on the inner side of only one substrate. Suitable substrates include any suitable porous or non-porous material. Preferably, the substrate is a porous material. Preferably, substrate is a flexible material, such as, but not limited to paper and polyester. Preferably, a positive pole powder is printed on the ink of the first substrate and a negative pole powder is printed on the ink of the second substrate. Most preferably, the pole powders are printed onto the current conductor inks, after drying the current conductor ink. An electrolyte containing a deliquescent material, an electrosoluble material and a watersoluble polymer is then printed onto the layer of negative pole and onto the layer of positive pole. Preferably, the electrolyte is printed onto the layers of pole after drying the layers of pole. In such a way, ~~way~~ a substrate with positive pole layers can be formed and a substrate with negative pole layers can be formed. Preferably, the positive pole layer and the negative pole layer include components (ingredients), which interact to self-form a separator layer between the negative and positive poles. More preferably, the electrolyte solution in the negative and positive pole layers include ingredients, which are selected such that an interfacial porous separator layer self-forms as a result of an interaction therebetween upon contacting. Preferably, the ingredients include one or more water-soluble polymer(s) and, optionally, one or more polymerizing agent(s). The first and second substrates are contacted with each other readily facilitating contact between components in the negative pole layer electrolyte and components in the positive pole layer electrolyte which interact to self-form a separator and such that the inner sides of the first and second substrates face the self-formed separator, so that a three layer cell is formed. In some embodiments, at a suitable stage in the process, a sealing

ingredient can be printed onto at least one of the pole substrates or onto both of the pole substrates. Preferably, the sealing ingredient is printed onto the perimeter of the substrates. Any suitable sealing ingredient can be used, such as but not limited to a glue, pressure sensitive glue, a heat sensitive glue, an adhesive, a melting material, an ultrasonic welding material, hot melt polymer or combination thereof. The sealing ingredient facilitates adhering and sealing together of the two pole substrates. In some embodiments, after the first and second substrate layers are joined together, high pressure can be applied to the regions with the sealant. This method can facilitate production of a substantially fully printed electrochemical cell.

Please replace paragraphs [0104]-[0105] with the following amended paragraphs:

[0104] Preferably, the electrochemical cell with a self-formed separator is made by a printing method as follows: In a first step an ink (current conductor) is printed onto inner sides of first and second substrates. Optionally, the current conductor ink can be printed on the inner side of only one substrate. Suitable substrates include any suitable porous or non-porous material. Preferably, the substrate is a porous material. Preferably, substrate is a flexible material, such as, but not limited to paper and polyester. Preferably, a positive pole powder is printed on the ink of the first substrate and a negative pole powder is printed on the ink of the second substrate. Most preferably, the pole powders are printed onto the current conductor inks, after drying the current conductor ink. An electrolyte containing a deliquescent material, an electrosoluble material and a watersoluble polymer is then printed onto the layer of negative pole powder and onto the layer of positive pole powder. Preferably, the electrolyte is printed onto the layer of pole after drying the layers of pole. In such a way, ~~way~~ a substrate with positive pole layers can be formed and a substrate with negative pole layers can be formed. An optional thin layer is interposed between the negative and positive pole layers. Preferably, the positive pole layer, the negative pole layer and the thin layer include components (ingredients), so that on contacting, the ingredients interact readily facilitating an interfacial separator self-forming at both sides of the thin layer. Preferably, the first and second substrates are contacted with the optional thin layer. Optionally, the thin layer can be printed onto one of the pole layers and the second pole layer is then applied onto or contacted with the printed thin layer. Contact between the negative pole layers, positive pole layers and thin layer, readily facilitates formation of a self-formed interfacial separator layer

between the negative pole layers and positive pole layers and as the reaction proceeds integrates into a single, self-formed interfacial separator layer between the negative and positive pole layers, such that the inner sides of the first and second substrates face the self-formed separator. In some embodiments, at a suitable stage in the process, a sealing ingredient can be printed onto at least one of the pole substrates or onto both of the pole substrates. Preferably, the sealing ingredient is printed onto the perimeter of the substrates. Any suitable sealing ingredient can be used, such as but not limited to a glue, pressure sensitive glue, a heat sensitive glue, an adhesive, a melting material, an ultrasonic welding material, hot melt polymer or combination thereof. The sealing ingredient facilitates adhering and sealing together of the two pole substrates. In some embodiments, after the first and second substrate layers are joined together, high pressure can be applied to the regions with the sealant.

[0105] FIG. 4 is another simplified block diagram of methods for forming an electrochemical cell, in accordance with preferred embodiments of the present invention. The steps of the methods for forming include: at 92, printing, or otherwise applying, a layer of positive pole powder onto a first substrate; at 94, printing, or otherwise applying, a layer of electrolyte on the layer of positive pole powder, wherein the electrolyte includes a self-forming separator layer ingredient; the steps of 92 and 94 resulting in 96 forming of positive pole layer; at 98, printing, or otherwise applying, a layer of negative pole powder onto a second substrate; at 100, printing, or otherwise applying, a layer of electrolyte on the layer of negative pole powder, wherein the electrolyte includes a self-forming separator layer ingredient; the steps of 98 and 100 resulting in 102 forming of negative pole layer and at 104, contacting the first substrate and the second substrate, readily facilitating interaction and/or reaction between the self-forming separator layer ingredients in at least the positive pole layer and the negative pole layer interface region to self-form an interfacial separator layer between the negative pole layer and the[[,]] positive-pole layer.

Please replace paragraph [0109] with the following amended paragraph:

[0109] FIG. 7b is a schematic cross sectional view of a coplanar electrochemical cell 220, in accordance with preferred embodiments of the present invention. As can be seen from FIG. 7b,

coplanar electrochemical cell 220 with self-formed separator 222 ~~220~~ includes a first substrate 201, a second substrate, 208, a positive pole 202, a negative pole 204 and a self formed separator 222. Contacting the two substrate layers, 201 and 208 of FIG. 7a, facilitates interaction and/or reaction between the self-forming separator ingredient/component/s in electrolyte 206 of first substrate and the self-forming separator ingredient/component/s in electrolyte 210 of second substrate facilitating formation of a self-forming separator 222.

Please replace paragraph [0116] with the following amended paragraph:

[0116] The formation of the interfacial separator as gel 60 or polymer precipitate 62 by physical interaction 58 can include, for example, precipitation of a polymer from polymer solution 66 by a polymer precipitating agent 68, an electrostatic cross-linking of a polymer from polymer solution 70 effected by a cross-linking agent 72 or a cross-linking of two or more polymers from polymer solution 78 and 80, which results in co-precipitation thereof.

Please replace paragraphs [0129]-[0131] with the following amended paragraphs:

[0129] This prediction was reduced to practice by contacting a pair of inert films, as described hereinabove, coated with an electrolyte solution of zinc chloride (55%) and PVA (8%-12%) with an aqueous solution of 10% PVP K-90 (containing 2% saturated solution of methylene blue in ethanol as an indicator) that was placed therebetween. It was found that zinc chloride progressively diffused ~~diff-used~~ into the polymer solution of PVP, and a gel or a polymer precipitate formed rapidly at the interface of the layers as a very thin blue colored film. The gel or polymer precipitate formed in these experiments had a thickness in the range of 12-17 μm, but it is to be understood that these are only exemplary values, and the invention is by no means limited to these values. The gel or polymer precipitate was formed as a relatively hard solid matrix that could be integrally separated from the layered structure.

[0130] In other experiments that were conducted to demonstrate a formation of an interfacial solid layer by a precipitation interaction, a different technique was used. This technique involved a pair of inert films, such as MYLAR® ~~MYLAR.RTM.~~, that was coated with a solution of 55% zinc chloride and 8-12% PVA. which were further coated with a thin layer of a PVP solution.

The two films were contacted and the gel or polymer precipitate immediately formed therebetween.

[0131] In other experiments that involved precipitation interaction, an interfacial solution containing a mixture of PVP and PVA (poly(vinyl alcohol)) was employed and the two techniques described ~~descried~~ hereinabove were performed. The obtained results showed that increasing the PVA concentration in the interfacial solution resulted in the formation of a gel or polymer precipitate that is much porous than that obtained using PVP alone and is therefore softer and includes a larger amount of the electroactive zinc chloride solution therein.

Please replace paragraphs [0136]-[0137] with the following amended paragraphs:

[0136] The unique feature of the alginate ~~algeinate~~ gel is the formation of a firm gel with a solid content of only 1-2%, which enables the formation of a separator that acts as a good mechanical barrier with a minimum sacrifice of conductivity.

[0137] Thus, it is shown herein that ~~herein-that~~ there may be a difference between the gel or polymer precipitate formed by an electrostatic cross-linking interaction as opposed to that formed by a precipitation interaction. The electrostatic cross-linking interaction can occur at low zinc ion ~~ions~~ concentrations and therefore the ionically cross-linked gel or polymer precipitate forms immediately upon contacting the zinc chloride solution even when relatively thick layers are used. Thus, the gel or polymer precipitate formation in this case occurs at early stages of the diffusion process, i.e., before the accumulation of high level of zinc ions at the interfacial layer. Contrary, the rate of formation of the gel or precipitate formed in the precipitation interaction, as in the example with PVP, was found to be time-dependent on the diffusion of zinc chloride into the PVP solution, as this interaction requires a build-up of high zinc chloride concentrations at the interfacial layer (e.g., higher than 17% for the precipitation interaction of PVP). Thus, the precipitation interaction is highly dependent upon the thickness of the layers.

Please replace paragraph [0142] with the following amended paragraph:

[0142] In this respect, it was found that interacting a solution of PAA alone (instead of a mixture of PAA with either PVP or PEOx) with an electrolyte solution of 8-12% PVA/55% zinc chloride resulted in the precipitation of small solid PAA fragments rather than a formation of a continuous film. This phenomenon can be attributed to the heat that develops upon mixing the two solutions, which affects the solubility of PAA in the formed interfacial solution. Since PAA was found soluble in 55% ZnCl.sub.2 only at a temperature higher than 40ºC ~~thani 40.degree. C.~~, it is assumed that contacting the two solutions results first in an exothermic interaction, which is followed by the precipitation of PAA and prevents a spontaneous precipitation of a continuous film. As an example of a cross-linking ~~cross-liking~~ chemical reaction which can be used to self-form an interfacial porous separator layer between positive and negative pole layers, one can consider the chemical cross-linking polymerization of acrylamide by bis(acrylamide) in the presence of TEMED (tetramethylethylenediamine) and with ammonium persulfate used as an activator for the cross-linking reaction. The overall concentration of the formed poly(acrylamide) and the relative concentration of acrylamide versus bis(acrylamide) can be used to dictate the overall porosity of the formed gel or polymer precipitate.